



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THÜMEN, FELIX VON. *Die Bekämpfung der Pilzkrankheiten unserer Culturgewächse*. Versuch einer Pflanzentherapie zum praktischen Gebrauche für Land- und- Forstwirthe, Gärtner, Obst- und Wein-züchter. Verlag von Georg Paul Faesy, Wien, 1886, paper, 8vo., pp. 157.

This modest little volume is a move in the right direction, and deserves more attention than it appears to have received in this country.

In a brief and interesting manner, albeit not in very choice German, the author describes some of the more destructive fungous diseases of orchard, garden, field, and forest, and states concisely the best methods of dealing with this class of diseases. In reading, however, one is especially struck by the advance which has been made in the treatment of the vine mildew, *Peronospora*, since 1885, when the author wrote: "A favorable result is not to be expected from any fungicide; up to this time at least all proposed remedies have proved totally inadequate, or at least impracticable on a large scale."

Thirty five distinct diseases are included, distributed as follows: 13 on field crops, 10 on fruit and garden vegetables, 6 on the vine, and 6 on forest trees.

In the introduction, which to the general reader is, perhaps, the most interesting portion, Professor von Thümen discusses those special conditions which, in his judgment, favor the increase of this class of diseases. They are:

- (1) The accidental introduction of foreign parasites (*Einschleppung*).
- (2) The almost universal neglect of field hygiene, meaning by this the destruction of neighboring wild plants, etc., which might harbor injurious fungi.
- (3) The growth of one crop repeatedly (*Hypercultur*) whereby every opportunity is given for the excessive multiplication of parasites.
- (4) Propagation by unnatural methods, *i. e.*, by layering, budding, grafting, etc.
- (5) The ever-increasing business intercourse and movement of population.

It is apparent from these statements that the author believes the control of this class of diseases lies largely in the hands of the cultivator. He should guard against foreign enemies; he should carefully destroy weeds, etc., likely to harbor parasitic fungi; he should practice rotation of crops; he should return as much as possible to varieties raised from seed, and, finally, he should keep a sharp watch lest enemies be introduced from neighboring localities in unsuspected ways, *e. g.*, with goods, seeds, grains, vines, etc.

His remarks on "the root-mould of the grape-vine" appear of sufficient interest to be reproduced in full, especially in view of the possibility that the mysterious and destructive vine disease of California may be due to some similar parasite.

"Within a few years—about six or eight—numerous complaints have

come from the vine districts of the most different lands about a so-called mysterious disease to which single vines or larger parts of the vineyard have fallen victim. Without visible cause stocks here and there in vineyards which have stood for decades or centuries in good cultivation and sound growth begin to be sickly, their leaves become yellowish, then withered and drooping, their ends and edges growing brown; end shoots and other young shoots dry up, and, in many cases, the whole aspect gives exactly the impression that the vineyard has been attacked by the vine-louse. At other times there occurs in the vine generally only an extremely slight vegetative activity, as one may readily observe if he passes through the vineyard in May or in the early part of June. Then we notice that the stocks attacked by the "mysterious" disease have developed only a very few short shoots, and these bear scanty, small leaves, and a few short abnormal-looking small clusters. Finally, we also meet vines with foliage of a peculiar green, difficult to describe, and on which a marked shortening of the internodes is especially striking, giving to the affected stock a bushy appearance which, in connection with a not very considerable but yet clearly visible crinkling (*krauslung*) of the leaves, has given to the affected stocks (in lower Austria) the common name ("*Kraupet*") frizzles (?).

A scrupulous examination of the roots shows that no vine-louse is at the bottom of this trouble; moreover no other insect, at least no abundantly appearing parasite, is present to which one might, perhaps, ascribe the sickening of the plants. Just as little can we find on the withering or dead leaves or shoots any fungous growth whose action has caused the sickening of the vine. It therefore happens in very numerous instances that the experts, practical or theoretical, who have been drawn thither stand helpless in face of the disease. It may be accepted as certain, moreover, that this disease is in no sense a new one, but that it has existed for a long time, although it probably formerly appeared much more rarely, and in consequence was overlooked and not considered. For a long time this described appearance has been known to vine-growers in France and Switzerland, and given them much concern. There, also, they got pretty well on the track of the symptoms of the disease, although many of the views, assertions, and explanations there published lack all permanency and scientific basis.

There is no doubt that the sole and only seat of the disease is to be looked for in the roots of the vine, and therein exactly, as well as in its extraordinary invisibility, is to be found the reason why the peculiar cause of the malady remained so long unknown. A fungus extremely invisible and easily overlooked, or more strictly a sterile fungous growth, is the cause of the sickness and death of the vine. If we examine minutely the roots of those vines which show some of the symptoms described in the beginning, we shall observe first of all a strikingly small number of fibrous and dependent roots, often, indeed, their entire absence; and further, we shall see on those still present, as well as on the

larger main roots, very delicate, fine, almost cob-web-like, white, fungous threads, which are abundant or scanty, conspicuous or with difficulty demonstrable, and which cover and overgrow the organ in many places, and sometimes even spin all around it. The great fragility and tenderness of these growths is, however, also the reason that they are so easily torn off and destroyed in pulling the vines out of the earth. On this account, for the more certain demonstration of the trouble, it is requisite that the removal of the vines be effected with special care and exactness. This fungus does not possess any organs of fructification, but consists entirely of very thin, hyaline, cylindric-tubular threads or hyphæ, septate at long intervals. It is nothing but a so-called sterile mycelium. Although the scientific identification and naming of such sterile forms is beset with great difficulty, still, without special violence, we can identify the root-mould of the vine with the growth *Fibrillaria xylotricha*, described by Persoon.

Similar sterile mycelia, which, in essential particulars, at least, do not depart from those on the roots of the vine, are found everywhere on decaying twigs and branches of deciduous and coniferous trees, as well as on all sorts of decaying wood lying below the earth's surface; finally also on the roots of very different plants, in short, wherever woody parts begin to decay. If, for example, in a shady forest we examine a heap of broken-off, withered branches or a pile of limb-wood, we very soon observe, as we throw it somewhat apart, that the whole mass is penetrated in all directions, in case it has remained undisturbed some weeks, by fine, hyaline, thin and delicate threads. Almost every single small branch is woven and spun over; and the moister the locality the more restricted the access of air, so much the more compact is the weft, so much the more numerous are the threads.

But this observation here communicated puts us at once on the right track; it shows us a parasite injurious to vine growing, but on the other hand gives us the method by which we can protect our plantations from its attacks. In like manner, as into the small branches and twigs, the encircling, thin, fungous threads penetrate into the roots of the vine, the tissues of which they disintegrate, first those of the outer bark, then, later, pushing steadily inward, they ramify between the wood cells, brown these first, and then bring them quickly to destruction, and thereby progressively the whole organ into decay. It is evident that the thinner and weaker roots first suffer the attacks of the invisible, but not on this account less dangerous, enemy, and this is why, as already emphasized, we find the diseased vine when lifted out of the ground almost wholly denuded of horizontal (*thau*) and fibrous roots, and entirely dependent upon the main roots for nourishment. For this reason, the sickening and decay of the plants, the main roots alone not being able to perform the function of sustenance.

If the subsoil of the vineyard is unduly impervious while the surface soil is very loamy and clayey, then the excessive wet, so hindered from

running off or settling down, causes easily of itself, as it stagnates, a growth of fungous mycelia, and the roots of the vine have accordingly to suffer from it in the way described. For overcoming such conditions we shall have to bring into use various methods adapted in each case to the local conditions, *e. g.*: drainage, thorough loosening and aerating of the soil, earth mixture by carting on sand, contingently also the addition of gypsum.

But in the greater number of cases man himself is the guilty party—the keeping clean of the soil being only too often grossly neglected. Upon the surface, indeed, the industrious and methodical vineyardist does not fall into error so easily, since several times a year the entire vineyard will be cut over (*behauen*) and carefully weeded by hand or by the plow. But this alone does not long suffice; the deeper portions of the soil must also be carefully cleaned, and this unfortunately is almost everywhere slighted, probably entirely neglected. If the branches and twigs lying in the open air form a most favorable soil for those tender, white, fungous threads, how much more must the same objects further their growth when buried deep in the earth where the air supply is so much more scanty. All wood fragments occurring in the soil figure as the most important spawn ground of such mycelia—and such fragments are never absent from the vineyard.

In the removal of old or dead vines, in intrenching (*vergruben*), etc., numerous root fragments always remain in the earth; in grubbing and hoeing (*behauen* and *hacken*) such are easily cut off; in pulling out vine palings in autumn numerous pointed ends are broken off and remain in the soil; enough wood fragments are accidentally introduced into the vineyard with the stable manure; dead twigs fall from the fruit trees frequently planted in the vineyard, or prunings occasionally remain; or pieces of roots are easily cut off in working the soil; or wood may be introduced in various other accidental ways. But we also bring many sorts of wood into the vineyard directly, especially where the objectionable custom prevails of burying deciduous and coniferous brushwood for the loosening and improvement of the soil. The described mycelia develop most luxuriantly upon all these various wood fragments—indeed, frequently enough such fragments are entirely covered with the mycelia, even before the wood is buried, and their migration to the roots of the vine and the infection of the latter is only a question of time.

But the causes of the root mould here described give at the same time a correct indication for the satisfactory treatment and banishment of this destructive disease. We have already spoken of a gradual improvement of the soil and drainage, but in addition the most punctilious preservation of the vineyard soil from all wood is the most certain means of protecting it from the root-mould. Again, it must be insisted on strongly that in pruning the vines the workman shall carefully gather and remove all the separated shoots, so that nothing whatever

shall remain lying about in the vineyard. Likewise in hewing must all resulting wood fragments be scrupulously gathered and immediately removed. All stocks once attacked by the disease must be pulled out and burned as soon as possible—all still existing roots, with the very utmost speed. Finally, moreover, care must be taken in the removal of vine stakes at the beginning of the winter that the points, sometimes broken off in this way, are not left in the ground. Were it in general practicable, from local or pecuniary reasons, to remove the vine palings entirely and substitute cultivation upon wires, then certainly one chief source of infection would be entirely removed. In conclusion, it may also be mentioned that where persons do not feel able to do without forest litter in the cattle stables and the use of the resulting manure in the vineyard, a frequent scattering of Stassfurt fertilizer or kainit in the stables and on the dung pile will result in good, as thereby, the beginning of this fungous mycelia will be hindered."

Three other underground parasites are considered—*Phasmodiophora*, *Dermatophthora necatrix*, and *Rosellina quercina*; but no mention is made of *Agaricus melleus* or of Hartig's *Trametes radiciperda*, which Brefeld now says (VII, p. 14) should unquestionably be referred to *Polyporus annosus*, Fr.—ERWIN F. SMITH.

DESCRIPTION OF PLATES.

PLATE IX (after von Tavel).

Glœsporium nervisequum.

FIG. 1. Cross-section through a vein and pustule of the fungus; the basidia are only partially drawn. The abscision of spores has not yet begun. x 380.

2. Spores. x 380.

Fenestella platani.

3. Cross-section through a young stage. The representation of the host plant is diagrammatic. x 128.

4. More advanced stage. x 128.

5. Same mature. The spore mass is only indicated. x 80.

PLATE X.

FIG. 1. *Langloisula spinosa* mycelium. E. A. Southworth, del.

2. Spores. E. A. S., del.

3. *Diorchidium Tracyi*, ure-dospores. E. A. S., del.

4. Teleulespores. E. A. S., del.

5. *Septosporium heterosporum*, tuft of conidia. After E. A. S.

6. Spores. After E. A. S.